GRANT

USER MANUAL 1981

AUTHOR: P. GROSBOL

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AUTHOR: P. Grosbol , ESO - Garching
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CHAPTER 3

OPERATION OF GRANT

3.1 INTRODUCTION

Preparing the microdensitometer for operation involves many steps which can be performed in many different ways. It is suggested, however, to follow the steps as outlined in this section. Only operations of the microdensitometer is described in this manual while instructions for operation and running the scan control programs are found in the Computer Program chapter of the Manual.

Note that most functions in the GRANT machine are controled by the satellite computer. Therefore, it is essential that the satellite control program is loaded and running. If some functions are not working properly try to run the program 'READY' and reload the satellite computer.

3.2 STARTUP PROCEDURE

1. Check that the power is on to the system rack and the microdensitometer. The X/Y coordinate display on the rack and some red lamps on the table control panel should be lit.
2. Switch the lamp on by pressing the LAMP button on the table control panel. If the red ON lamp does not lit reload the satellite control program and try again.
3. Switch the motor on by pressing the MOTOR button on the table control panel.
4. Check that the table can be moved by pressing one of the X-axis COARSE position buttons on the table control panel.
5. Turn on the oscilloscope and PMT high voltage by turning the OFF-FOCUS knob on the oscilloscope a half revolution clockwise.
6. If scans should be made check that the transmission and logarithmic amplifiers in the rack are switched on.

3.3 CLOSEDOWN PROCEDURE

1. Terminate the GRANT control program by giving the command 'BYE'.
2. Switch off the oscilloscope by turning the OFF-FOCUS knob fully anticlockwise.
3. Switch the lamp off by pressing the LAMP button.
4. Switch the motor to standby by pressing the MOTOR button.

3.4 OPTICAL CALIBRATION

The optical calibration and adjustment consist of plate alignment, choosing objective, adjusting the cathode ray oscilloscope (CRO), setting the slit and alignment of the preslit. The latter is not needed when manual measurements are made.

3.4.1 Plate Alignment And Objective Selection

1. Move X and Y stage travels to roughly the midpoint of their travel range.
2. Check that the plate alignment carrige is approximately centered with respect to its travel, and with respect to its pivotal rotation. Pivotal rotation is centered by means of the Plate Alignment Knob.
3. Place the plate on the stage table so that the spectral band runs beneath the objective lens, and the spectrum appears more or less parallel with the edge of the glass table insert.
4. Select objective and insert it. For manual measurements the Zoom lens is used while one of the three small objectives (i.e. with 17x, 25x or 42x magnification) should be used for scanning. The magnification is chosen so that the space between the inner edges of the comparison lines is less than 20 mm.
5. Focus the spectrum on the screen using the knob to the right of the objective.
6. Insert the preslit in the optical path and focus it on the screen using the FOCUS knob to the left of the Y-axis handwheel.
7. Remove the preslit from the optical path.
8. Clamp one end only of the spectrum plate with spring stage clips.
9. Loosen the Plate Alignment Device locking clamp.
10. Move the Plate Alignment carrige back and forth; make fingertip adjustments of the free end of the plate until the spectral band remains reasonable parallel to the horizontal crosshair as its image moves across the viewing screen.
11. Clamp free end of the plate. Use the Y-ais handwheel to bring one edge of the spectral band into contact with the horizontal viewing screen crosshair.
12. A few additional translations of the Plate Alignment carrige and discreet adjustments of its pivotal rotation will bring

the spectra into as precise alignment as desired.
13. Lock the Plate Alignment carrige in its central position by tightening its locking clamp.

3.4.2 CRO Adjustment

1. Check that the CRO is turned on. The OFF-FOCUS should be turned approximately half revolution clockwise.
2. Check that the scanning prism is free (i.e. the prism-locking plunger is pushed fully in).
3. Check that the scanning prism is rotating. If not switch it on using the switch on the right side of the microscope body). The red lamp should be lit.
4. Adjust the X POSITION (i.e. outer ring on the X POSITION/GAIN knob) and Y POSITION so that the tracing is located 1-2 cm above the center of the CRO display.
5. Adjust the INTENSITY and FOCUS until the tracing is sharp and the conection between the two end points can be seen clearly.
6. Set the X GAIN so that the sweep just fits the CRO display. Use SWEEP ADJUSTMENT knob on the front part of the right side of the microscope body.
7. Use the Y-axis handwheel to position a sharp comparison line on the viewing screen until it is bisected by the horizontal crosshair.
8. Select the STELLAR mode on the mask control.
9. Check that the preslit is taken out of the optical path.
10. Set the SLIT WIDTH to 100 microns if the magnification is less than 20x otherwise to 60 micron (preliminary setting).
11. Set the SLIT HEIGHT and SAMPLE to approximately 3/4 the height of the line image as noted on the engraved viewing screen mm scale (preliminary setting).
12. Scan with the X-axis handwheel until a set of well-peaked tracings appear near the center of the CRO display.
13. Adjust The stellar Y GAIN (i.e. inner ring) for a good amplitude tracing. If needed increase the PMT voltage.
14. Carefully adjust the upper objective focus knob until a position is reached where the profile tracing obtain maximum amplitude. NOTE: Once optimum focus is set, it should not be re-adjusted during a series of wavelenght measurements made from a common reference position or during scanning.
15. Set the RESPONSE SPEED to 1-2 microseconds if very broad lines should be measured whereas 6-10 microseconds is chosen for very fine lines.

3.4.3 Slit Adjustment

1. Position the centrum of the spectrum on the horizontal crosshair using the Y-axis handwheel.
2. Measure the total height of the spectrum on the engraved mm scale
3. Set the SAMPLE dial to this height minus at least one mm to permit masking of the line ends.
4. Measure the gap between the inner ends of the comparison

spectra. Add at least one mm to this value and set the INNER COMPARISON dial to this number.

5. Determine the total space between the outer comparison limits on the engraved scale and the SLIT HEIGHT to this value minus at least one mm.
6. Set the SLIT WIDTH to maximum if manual measurements should be made otherwise to the desired slit width times the magnification.
7. Set the mask control to COMPARISON position.
8. Center a comparison line on the slit by rotating the X-axis handwheel and watching the tracing.
9. Observe the tracings produced by alternately flipping between upper and lower half of the slit. Adjust the SLIT ANGLE dial as necessary to obtain close agreement between the upper and lower segments.
10. The central part of the spectrum can be obscured by setting the CENTRAL MASK dial. If all the spectrum should be measured this dial must be set to zero.
11. Switching between STELLAR and COMPARISON positions on the mask control adjust the STALLAR and COMPARISON Y-GAIN so that the amplitude of the tracings are roughly equal.

3.4.4 Preslit Alignment

This calibration step is only needed when scans of plates are performed. For manual measurements the preslit assembly is taken out of the optical path.

1. Insert the preslit assembly in the optical path.
2. Insert the blue filter in the optical path.
3. Check the focus of the preslit on the screen. It may be adjusted on the FOCUS knob to the left of the Y-axis handwheel. The CRO may be used for the final check. NOTE: do not change the focus of the upper objective.
4. Turn off the scanning prism motor on the right side of the microscope body. Wait until it has stopped spinning and lock it by pulling out the prism-locking plunger.
5. Switch the PM-select to PM-OUT position.
6. Check that the amplifiers in the lower part of the system rack are switched on.
7. Set the preslit HEIGHT to the value chosen for the slit height.
8. Set the preslit WIDTH to 2 times the actual slit width at the plate (i.e. the slit width setting divided by the magnification).
9. Set the MODE-select to '%T' on the amplifier chassis.
10. Position the slit on an unexposed part of the plate.
11. Set the mask control to STELLAR position.
12. Adjust the preslit X-DIRECTION knob for maximun reading on the DIGITAL meter on the system rack. If the value reaches 1023 the GAIN of the transmission amplifier or the PMT voltage should be reduced. NOTE : The PRESLIT knob must not be touched after the X-DIRECTION has been adjusted. This will affect the X position of the preslit.
13. Switch the mask control to COMPARISON position.

14. Adjust the preslit ANGLE for a additional maximum DIGITAL meter reading to align the preslit and the slit. If more than a minute adjustment of the angle is necessary, it is advisable to redo step 11 to 14.

3.5 ANALOG SYSTEM CALIBRATION

The calibration of the analog system is only needed when plates should be scanned. Calibration and scanning must be done with the preslit to avoid scattered light. In any case densities above 3.0 cannot be trusted due to noise in the system.

3.5.1 Transmission Mode

1. Check that the scanning prism is switched off and locked. The red lamp on the right side of the upper microscope body is not lit. If it is on switch it off and wait some minutes for the prism to stop rotating before locking it by pulling the knob out.
2. Insert the blue filter in the optical path.
3. Turn the PM-select switch to PM-OUT position.
4. Set the PMT voltage to 5.0
5. Check the RESPONSE SPEED is set to 4 microsec.
6. Set the MASK control switch to STELLAR position.
7. Switch the MODE selector on the amplifier chassis to '%T' position.
8. Position the slit on the part of the plate where transmission should be defined to 1.0 (e.g. clear plate or plate fog).
9. Set the GAIN select to 10 or 30 depending on the plate fog (i.e. high gain for dark plates).
10. Adjust the FINE GAIN knob on the amplifier chassis until the DIGITAL meter on top of the system rack reads 1000. If this is impossible the PM voltage on the osciloscope control panel may be increased. With this adjustment one unit in the output data will correspond to -0.005 in transmission with a zero point at a value of 2000.

3.5.2 Density Mode

1. Perform step 1-10 in the transmission calibration.
2. Switch the MODE select to '0.D.' position.
3. Check that the TIME select is on 2 microsec.
4. Adjust the OFFSET dial until the ZERO LEVEL meter and the DIGITAL meter read 0.
5. Switch the MODE select knob to '%T' position.
6. Position the slit on a more dense area and note the DIGITAL meter reading T. The value of T should be in the range 100 to 500.
7. Switch the MODE select to '0.D.' position.
8. Adjust the logaritmic GAIN knob for a DIGITAL meter reading of 100*log(1000/T) (use the 'T/D'-command in the GRANT

control program). Then one unit in the output data will correspond to -Ø.ØØ5 density unit with a zero point at a value of 2Ø47.

3.6 SCANNING

After the optical and analog systems are calibrated measurments can be made. All light in the room should be switched off when the machine is scanning to avoid stray light. Scans can be performed in the GRANT control program 'GRANT' (online or offline) or by running user application programs. These programs are described in the Computer Program chapter of the manual.